

Advanced Algorithms and Controls for Superior Robotic All-Terrain Mobility, Phase II

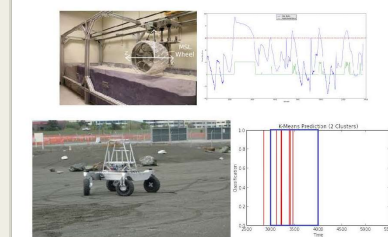
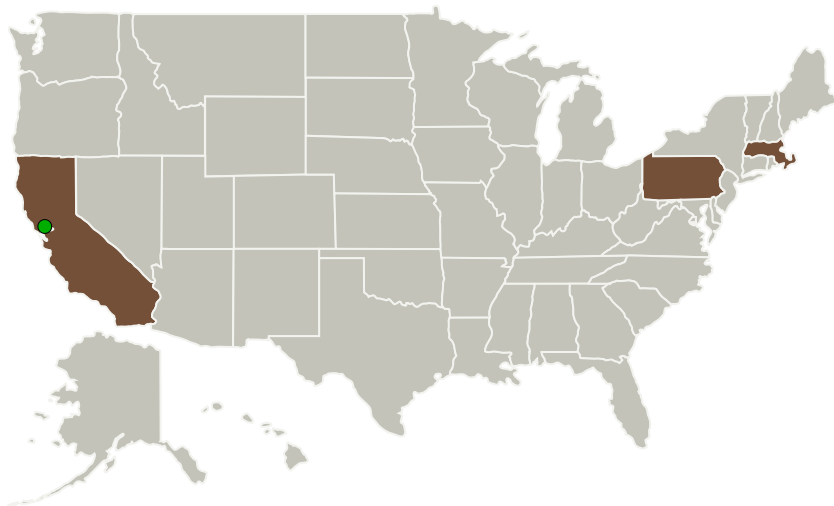
Completed Technology Project (2015 - 2018)



Project Introduction

ProtoInnovations, LLC (PI) and the Massachusetts Institute of Technology (MIT) have formed a partnership to research, develop, and experimentally characterize a suite of robotic controls to significantly improve the safety, mean travel speed, and rough-terrain access of wheeled planetary rovers. In meeting this goal we have been developing algorithms for all-terrain adaptive locomotion which include: 1. Advanced traction controls, which intelligently govern individual wheel commands as a function of terrain conditions in order to measurably decrease wheel slip; and, 2. Real-time incipient embedding detection controls, which monitors the rover's inertial signature to rapidly and robustly detect instances of incipient embedding in soft, low bearing-strength soils. The implementation of these controls will not only allow rovers to autonomously detect and avoid hazardous terrain regions, but also to travel with assured safety on terrain that is steeper and rougher than is currently possible. Moreover, these controls will allow rovers to drive with a reduced risk of catastrophic failure, while simultaneously increasing both the quantity and potential quality of science data products. This latter capability is enabled by the fact that rovers will be able to travel for long durations without requiring lengthy human interventions, and will be able to travel to sites of greater scientific interest (and proportionally greater mobility difficulty) than what is possible today.

Primary U.S. Work Locations and Key Partners



Advanced Algorithms and Controls for Superior Robotic All-Terrain Mobility, Phase II Briefing Chart Image

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destinations	3

Advanced Algorithms and Controls for Superior Robotic All-Terrain Mobility, Phase II

Completed Technology Project (2015 - 2018)



Organizations Performing Work	Role	Type	Location
Protoinnovations, LLC	Lead Organization	Industry	Pittsburgh, Pennsylvania
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Massachusetts Institute of Technology(MIT)	Supporting Organization	Academia	Cambridge, Massachusetts

Primary U.S. Work Locations

California	Massachusetts
Pennsylvania	

Project Transitions

▶ **May 2015:** Project Start

✓ **February 2018:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137663>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Protoinnovations, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

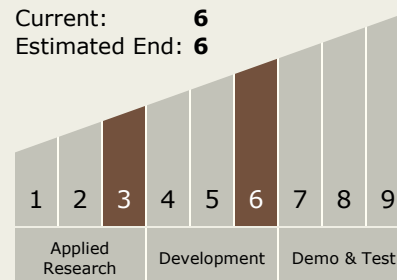
Carlos Torrez

Principal Investigator:

Karl Iagnemma

Technology Maturity (TRL)

Start: 3
Current: 6
Estimated End: 6

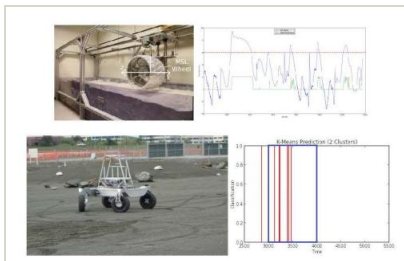


Advanced Algorithms and Controls for Superior Robotic All-Terrain Mobility, Phase II

Completed Technology Project (2015 - 2018)



Images



Briefing Chart Image

Advanced Algorithms and Controls for Superior Robotic All-Terrain Mobility, Phase II Briefing Chart Image

(<https://techport.nasa.gov/image/130890>)

Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.2 Mobility
 - └ TX04.2.4 Surface Mobility

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System